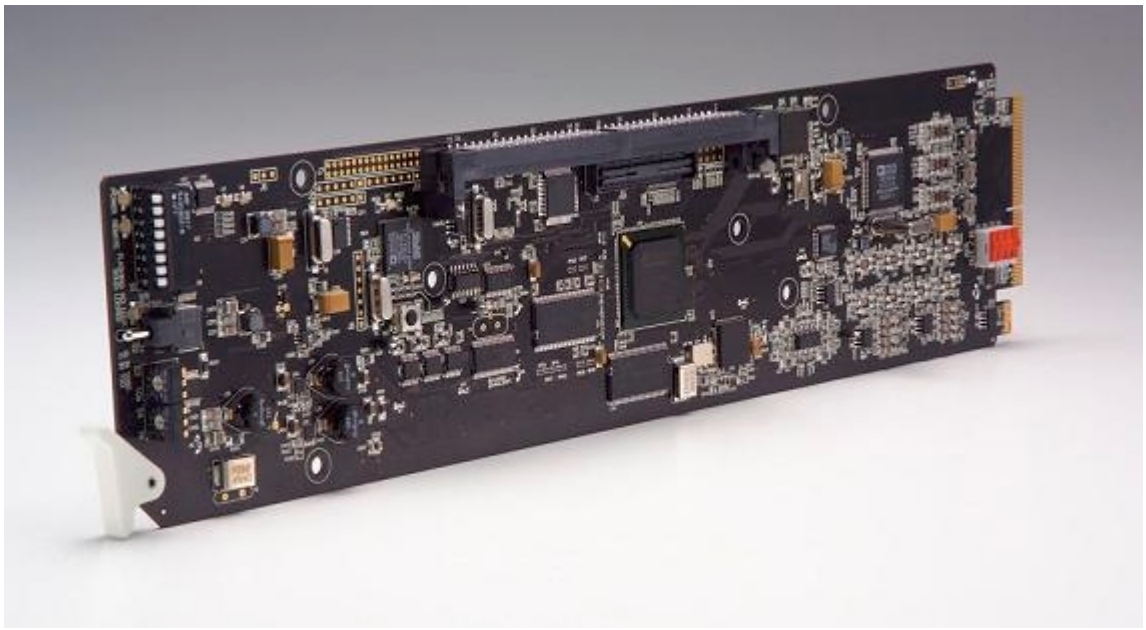
Cobalt Digital Inc.

9033

Preliminary Owner's Manual



9033-OM
Version: 0.5

9033 • Owner's Manual

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Important Regulatory and Safety Notices

Before using this product and any associated equipment, refer to the "Important Safety Instructions" listed below so as to avoid personnel injury and to prevent product damage.

Products may require specific equipment, and /or installation procedures be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.

Warning

The symbol with the word **"Warning"** within the equipment manual indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

Caution

The symbol with the word "**Caution**" within the equipment manual indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Notice

The symbol with the word "**Notice**" within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.

ESD Susceptibility

This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions

Caution

This product is intended to be a component product of the openGear™ frame. Refer to the openGear™ frame Owner's Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as it's component products.

Warning

Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis' rear appliance connectors before servicing this area.

Warning

Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing.

This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained within the product's power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair.

To reduce the risk of fire, replacement fuses must be the same type and rating.

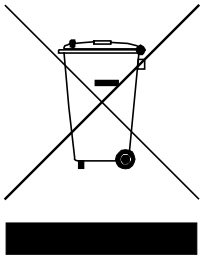
Only use attachments/accessories specified by the manufacturer.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Cobalt Digital encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Cobalt Digital for more information on the environmental performances of our products.

openGear Contents

Introduction 6

In This Chapter....6
A Word of Thanks....6
Overview....6
Functional Block Diagram....7
Supported Audio and Video Formats....8
Input and Output Video....8
Embedded Audio....9
Analog Audio....9
Discrete AES Audio Input....9
Documentation Terms....9

Installation and Setup 10

In This Chapter....10
Static Discharge....10
Unpacking....10
Rear Module Installation (Optional)....11
Board Installation....12
Cable Connections....12
Card Control and Status....13
Card Status....13
Menu Navigation....13
Menu Structure....13
Parameter Type Descriptions....15
Factory Default Settings....16

Remote Control 17

In This Chapter....17
DashBoard Control System Software....17

Service Information 19

In This Chapter....19
Troubleshooting Checklist....19
Warranty and Repair Policy....19

Ordering Information 21

9033 and Related Products....21

Contact Us 23

Contact Cobalt Digital Inc....23
Visit us at the Cobalt Digital Inc. website....23

Introduction

In This Chapter

This chapter includes the following sections:

- A Word of Thanks
- Overview
- Functional Block Diagram
- Supported Audio and Video Formats
- Documentation Terms

A Word of Thanks

Congratulations on choosing the openGear™ **9033 Analog to Digital Converter with Audio Embedding**. The 9033 is part of a full line of modular conversion gear for broadcast TV environments. The Cobalt Digital openGear™ line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, and much more. Cobalt openGear™ modular conversion gear will meet your signal conversion needs now and well into the future.

Should you have questions pertaining to the installation or operation of your 9033, please contact us at the numbers listed on the back cover of this manual. We are happy to help with any questions regarding this or any other openGear™ card.

Overview

The 9033 is a high quality analog to digital converter which also features an audio embedder capable of embedding audio signals into HD or SD SDI signals.

The 9033 has a full featured, high quality, 12-bit analog to 10-bit serial digital converter. The dual rate HD/SD analog video input can accept all common analog video formats and will autodetect between HD and SD.

The embedder on the 9033 can best be thought of as an audio router on a card. On the input side of the router are the up to 16 channels of embedded AES in the input video, the up to16 channels (8 pairs) of discrete AES input, and up to 8 channels of differential analog audio input. On the output side are the up to 16 channels of embedded AES audio. The router acts as a full audio cross point: each of the 16 embedded output channels can receive signal from any one of the 40 (16 embedded AES, 16 discrete AES, 8 Analog) input channels. Each output also allows gain adjustment and optional polarity inversion.

Audio rates are always 48kHz nominally but discrete AES inputs pass through sample rate converters to align them with the output timing. Output AES is always precisely locked in time with the output video. Analog audio is differential input and sampled at 48 kHz with 0 dbFS digital equivalent to +24 dBu analog. Dolby decoding is available from embedded audio or external AES, with the purchase of the Dolby decoding option.

The product also provides full color processing control of the output video, with separate controls for Gain, Lift, Saturation and Color Phase.

All card features are controlled through the card edge menu interface. There is a 4 character display, a toggle switch, and two buttons to allow for intuitive control of all device features. All of the controls on the card edge menu can also be accessed through the free remote control software Dashboard, provided the openGear™ frame has a 8310-N network card installed.

The card has persistent storage of all settings. There is a menu option to trigger a save or load of stored settings, or to restore the factory default configuration.

The input and outputs of the 9033 are the following:

Input:

- One dual-rate HD/SD-SDI video input
- One 3-BNC dual-rate HD/SD analog video input
- 4 dedicated AES input connections (AES input 5-6)
- 8 differential analog audio inputs

Outputs:

- Two dual-rate HD/SD-SDI video outputs
- 8 dedicated AES output connections. (AES output 1-8)

Functional Block Diagram

The 9033 has a very flexible signal flow path and feature set that combines several products into one compact package. This section describes the basic operation of your 9033 product.

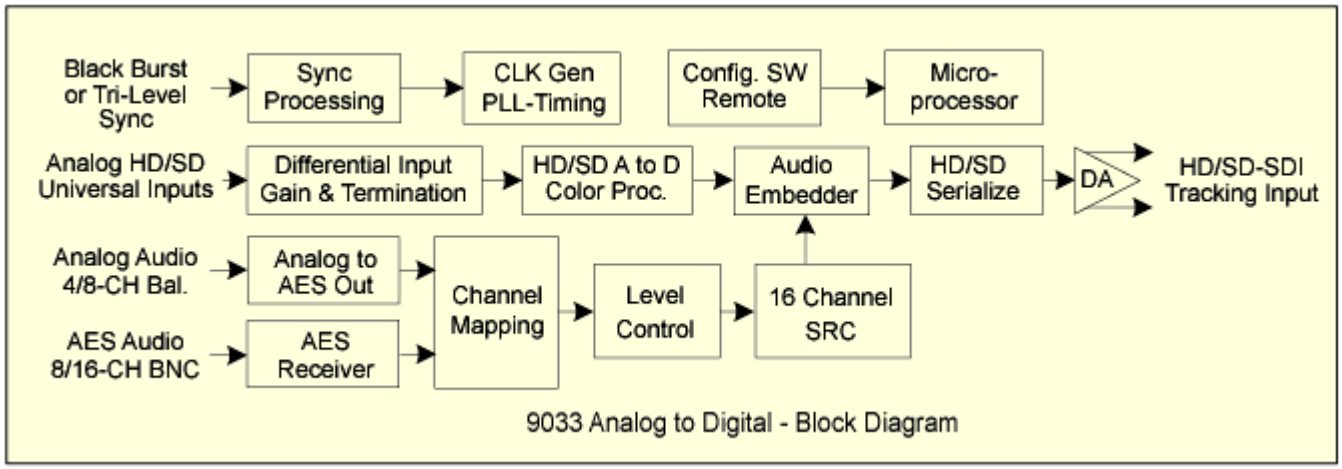


Figure 1. Simplified Block Diagram of 9033 Functions

The 9033 is an analog to digital converter that also features an embedder which can embed both analog audio and AES. For the audio embedded on the SDI output, the card acts as a router that can map any input channel to any channel on the embedded SDI output. The router inputs are de-embedded audio, discrete AES audio, and differential analog audio.

Each router for the embedded output provides a gain and polarity control, and **each router output can be sourced from any input channel**. This router feature gives your 9033 a great deal of flexibility.

There is also a video proc module to allow any necessary corrections to the inbound video signal. It has separate controls for Luma gain (Y channel), Saturation (C channel gain), Lift (Y channel offset), and Phase adjustment (C channel).

Supported Audio and Video Formats

Input and Output Video

The 9033 supports a wide range of video formats. The output video rate is always precisely the same as the input video rate. Video delay through the device is less than one microsecond.

Table 1. Supported Analog and SDI formats

Video standard	
1080	sF 23.98
1080	p 23.98
1080	sF 24
1080	p 24
1080	i 25
1080	p 25
1080	i 29.97
1080	p 29.97
1080	i 30
1080	p 30
720	p23.98
720	p24
720	p 25
720	p 29.97
720	p 30
720	p 50
720	p 59.94
720	p 60
486	i 29.97
575	i 25

Notes:

1. All rates translated to effective frame rates, interlaced rates " i " are two times the number shown. For example, i 29.97 is 59.94 fields per second (two fields per frame thus the interlaced frame rate is 29.97); but progressive " p " 29.97 is 29.97 frames per second.

2. SD active line rates are PAL (575) and NTSC (486).

Embedded Audio

The 9033 supports all four groups (16 channels) of embedded audio at full 24 bit resolution in both SD (with extended data packets) and HD.

Analog Audio

The 9033 supports 8 channels differential analog audio. The analog audio is encoded in such a way as to make +24 dBu (analog) equivalent to 0 dBFS (digital). Analog audio conversion can be disabled to reduce power consumption.

Discrete AES Audio Input

The 9033 can accept 16 channels (8 pairs) of discrete AES audio on 75 ohm BNC connections. The AES must have a nominal rate of approximately 48 kHz. Sample rate conversion is employed to account for minor clock rate differences in the AES stream and the input video stream. However, the card does not support AES input at 32 kHz, 44.1 kHz, 96 kHz or 192 kHz rates.

Documentation Terms

The following terms are used throughout this guide:

- "**Frame**" refers to the **8310** frame that houses the **9033** card.
- "**Operator**" and "**User**" both refer to the person who uses the **9033**.
- "**Board**" and "**Card**" all refer to the **9033** card itself, including all components and switches.
- "**System**" and "**Video system**" refers to the mix of interconnected production and terminal equipment in which the **9033** operates.

Installation and Setup

In This Chapter

This chapter includes the following sections:

- Static Discharge
- Unpacking
- Rear Module Installation (Optional)
- Board Installation
- BNC Connections
- Menu Structure
- Factory Defaults

Static Discharge

Whenever handling the card and other related equipment, please observe all static discharge precautions as described in the following note:

ESD Susceptibility

Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.

Unpacking

Unpack each card you received from the shipping container, and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Cobalt Digital directly.

Rear Module Installation (Optional)

If you are installing the card in a 8310-C-BNC or 8310-BNC frame (one with a 100 BNC rear module installed across the entire back plane), skip this section.

If you are installing the card into a slot with no rear module, you should have ordered and received a 8310-RM-10 Rear Module with your card. You will need to install it in your 8310 frame before you can connect cables.

Use the following steps to install the 8310-RM-10 in an 8310 openGear™ frame:

1. Refer to the openGear™ 8310 frame Owner's Manual, to ensure that the frame is properly installed according to instructions.
2. On the rear of the 8310, locate the card frame slot.
3. As shown in Figure 2, seat the bottom of the 8310-RM-10 in the seating slot at the base of the frame's back plane.

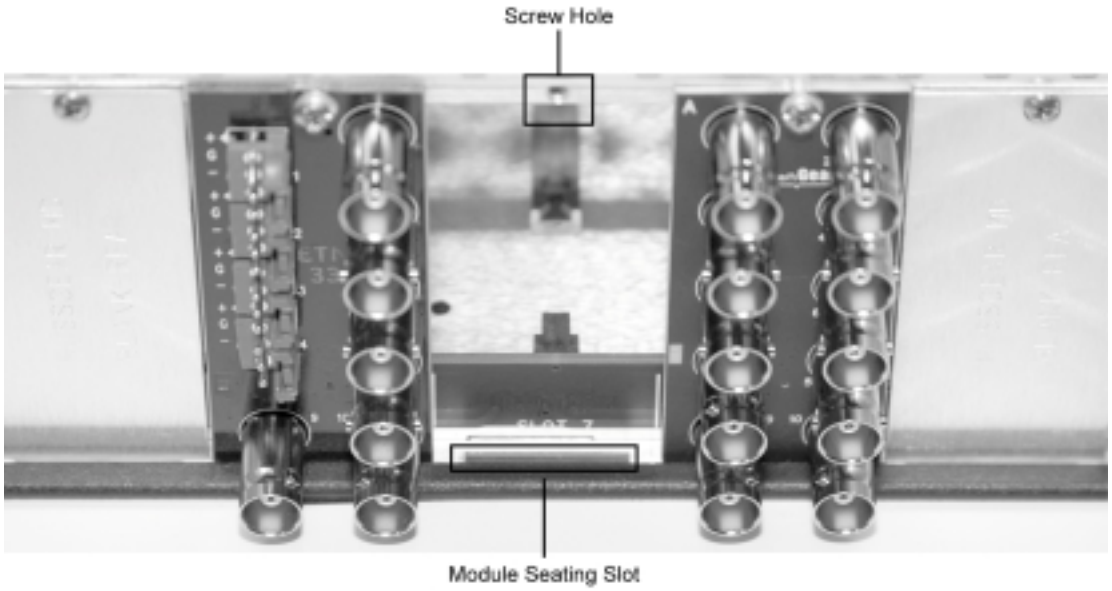


Figure 2. Rear Module Installation

4. Align the top hole of the 8310-RM-10 with the screw hole on the top edge of the 8310 back plane.
5. Using a Phillips driver and the supplied screw, fasten the 8310-RM-10 panel to the 8310 back plane. Do not over tighten.

This completes the procedure for installing the 8310-RM-10 in an 8310 openGear™ frame.

Board Installation

Use the following steps to install the card in the openGear™ 8310 frame:

1. Refer to the Owner's Manual of the openGear™ 8310 frame to ensure that the frame is properly installed according to instructions.

Warning

Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using convection cooling.

2. After selecting the desired frame installation slot, hold the card by the edges and carefully align the card edges with the slots in the frame. Then, fully insert the card into the frame until the rear connection plugs are properly seated on the midplane and rear modules.

This completes the procedure for installing the card in the openGear™ 8310 frame.

Cable Connections

This section provides instructions for connecting cables to the installed BNC rear modules on the 8310 series frame backplane. Connect the input and output cables according to the following diagram. The input is internally terminated with 75 Ohms. It is not necessary to terminate unused outputs.

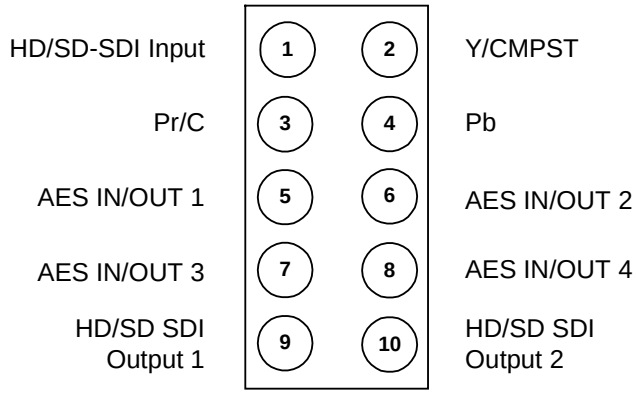


Figure 3. BNC Designations for the Card Rear Module 8310-RM-10 or 8310-RM-100

In the near future, Cobalt Digital Inc. will release a series of rear modules that allow access to the full IO capabilities of the card.

Card Control and Status

Card Status

The card indicates the status of the input signal with the four blue LEDs labled with the different supported formats (1080, 720, 625, 525). When the card has locked to a particular input format, that LED will be illuminated. When the card has not locked to a particular video format, the card will search all possible formats, and the lights will cycle rapidly.

Menu Navigation

The card can be configured from a menu system built in to the front card edge. This provides an intuitive and easy to use method for exploring and using the features of the card.

The menu is navigated by using the toggle switch and the two push buttons. The lower button is the "Enter" button to enter a submenu, and the upper button is the "Exit" button to exit a submenu. Moving the toggle switch up or down moves up or down in menu choices, and pressing the buttons moves in or out of sub menus.

The menu LEDs will illuminate from top to bottom to indicate increasing depth in the menu.

Menu Structure

The entire 9033 menu looks like this:

MENU STRUCTURE					**Parameter Type**
Vid	Proc		Enbl		Proc Enable
			Gain		Proc Gain
			Lift		Proc Lift
			Sat		Proc Sat
			Phas		Proc Phase
	Dec		SDIN		Decoder SD input
			HDIN		Decoder HD input
			PED		Pedestal - SD Setup
	Sorc		SDI		Select Priority Source SDI
			Anlg		Select Priority Source Analog
Aud	Embd	Grp1	Enbl		Embedded Group Enable
			Ch01	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch02	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch03	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch04	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
		Grp2	Enbl		Embedded Group Enable
			Ch05	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity

			Ch06	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch07	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch08	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
		Grp3	Enbl		Embedded Group Enable
			Ch09	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch10	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch11	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch12	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
		Grp4	Enbl		Embedded Group Enable
			Ch13	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch14	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch15	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
			Ch16	Src	Output Source
				Gain	Output Gain
				Pol	Output Polarity
Disp	H/V				Display Orientation
	BRGT				Display Brightness
Prst	Save				Save Settings
	Load				Load Settings
	Fact				Restore Factory Settings
Info	+POW				Positive Watts Consumed
	-POW				Negative Watts Consumed
	SWR#				Software Release Number
	SWB#				Software Build Number

Parameter Type Descriptions

Proc Enable

Enables the Proc module. You can keep all the proc settings, and enable/disable the module without having to reset the set

Proc Gain

This is Luma (Y channel) gain, expressed as a percentage. It ranges from 0.0% to 200.0% in 0.1% steps.

Proc Lift

This is Luma (Y channel) offset, expressed as an actual video value ranging from -1024 to 1024. If set to 0 no change is made. If set to 1024 absolute black (value 004) becomes absolute white (value 3FB). If set to –1024, absolute white becomes absolute black.

Proc Saturation

This is Chroma (C channel) gain, expressed as a percentage. It ranges from 0.0% to 200.0% in 0.1% steps.

Proc Phase

This is Chroma (C channel) phase adjustment, expressed in degrees, ranging from –360 to +360 in steps of one degree.

Decoder SD Input

Selects the input format for SD analog video. This must be changed to reflect the analog video format on the input for the 9033 to lock correctly. Valid SD formats are GBR, Component SMPTE, Component MII, Component Betacam, Component Y/C, and Composite.

Decoder HD Input

Selects the input format for HD analog video. The user must select between GBR and YPbPr for the 9033 to lock to the input correctly.

Pedestal - SD Setup

Selects between no setup and 7.5 IRE on the input analog SD signal. This tells the card how much setup needs to be removed from the input.

Embedded Group Enable

Enables or disables the embedding of a particular embedded audio group. Disabling a group preserves the settings of the channels belonging to that group.

Output Source

Because the cards audio system functions like a router, each embedded output can be sourced from any input channel. This parameter let's you choose from the many different sources. Here is an explanation of the different source names:

Source Name	Description
EmXX	Input embedded audio channel XX (1 through 16)

AnX	Analog Audio channel X (1 through 8)
AeXX	Discrete AES channel XX (1 through 16)

Output Gain

The gain of each output is adjustable from +30 dB to –100 dB in 0.1 dB steps. After –100 dB gain is set to –Inf, which means that output is present, but muted.

Output Polarity

If set to “Norm” output polarity is the same as input polarity, if set to “Inv” the output polarity is inverted. This can be used to correct polarity errors in the input signals fed to the card.

Display Orientation

This parameter lets you change the orientation of the display. “Vert” makes the characters look correct when the cards are mounted in a 2 RU frame like the 8310. “Horz” makes the characters look right in a horizontal frame.

Display Brightness

This parameter allows you to set the standard output brightness of the menu display. It is a percentage of maximum brightness.

Save Settings

In this parameter, move the toggle switch up to save the settings to the card persistent storage.

Load Settings

In this parameter, move the toggle switch up to load the saved settings and make them active.

Restore Factory Settings

In this parameter, move the toggle switch up to make the factory default settings active, and make the stored settings equal to the factory settings.

Info

This menu gives information about the card including, positive and negative power consumption in watts, software release number, and software build number.

Factory Default Settings

The factory default settings are as follows:

1) The proc module is enabled, but all parameters are set to not change the video.
2) The video decoder is set to Component SMPTE for SD and YpbPr for HD.
3) Discrete AES inputs 1-16 are mapped to embedded audio outputs 1-16.
4) Audio gain is set to 0dB and polarity is set to normal on all channels.

Remote Control

In This Chapter

This section provides a detailed explanation on using remote control functions with your card.

DashBoard Control System Software

The DashBoard Control System enables you to monitor and control openGear™ frames and controller cards from a computer. The DashBoard software and manual can be downloaded from the Cobalt Digital Inc. website.

Using the Menus

You must first install the DashBoard Control System software on your computer. Refer to the ***DashBoard User Manual*** for software installation procedures and for using the DashBoard interface.

The Menu System

The following table and sections describe the menus, items, and parameters available from the DashBoard Control System software for the card.

Table 3. DashBoard Menus

Menu	Item	Parameters	Description
Card Info (Read-only)	Product	CDI-9061	
	Manufacturer	Cobalt Digital Inc.	
	Software Release Number	#	
	Software Build Date		
	Software Build Time		
	+12 V Power Rail	#.## W	Positive Supply Voltage
	-7.5 Power Rail	#.## W	Negative Supply Voltage
	Video Input Standard		Detected Video Standard on SDI Input
	Reference Standard		Detected Standard of Ref.

Menu	Item	Parameters	Description
Card Info (Read-only)	SSN	###########	Displays the Silicon Serial Number of the card.
Embedded Audio Group (Groups 1-4)	Group Enable	Enable	Enables or disables the entire group of 4 channels.
		Disable	
	Source	Embedded 1-16	Chooses the source for the embedded audio. The source for each channel can be chosen separately.
		AES 1-16	
		Analog 1-8	
		Silence	
	Gain	Range (-999) - 300	Gain applied to embedded audio output.
	Phase	Normal	Inverts the phase of the embedded audio.
		Invert	
Presets	Parameter Save	Confirm	Saves the parameters as preset.
	Parameter Load	Confirm	Loads paramaters previously saved.
	Restart Parameters to Factory Default	Confirm	Will load factory presets and overwrite the save.
Video Signal Controls	Input Video Preference	SDI	This selects the preferred input when both SDI and analog are present.
		Analog	
	SD Input Type	Composite	Selects the format of input SD analog video, so the decoder can properly decode the signal.
		Y/C	
		YPbPr BetaCam	
		YPbPr Mll	
		YpbPr SMPTE	
	HD Input Type	GBR	Selects the format of input HD analog video.
		YpbPr	
	SD Composite Contains	0.0 or 7.5 IRE of Setup	Enables or disables setup for SD.
Video Proc	Proc Controls Enable	On	Enables/Disables Proc
		Off	
	Video Gain	Range 0-2000	Contrast
	Video Lift	Range (-999) – 999	Brightness
	Color Gain	Range 0-2000	Saturation
	Color Phase	Range (–360) - 360	Tint

Service Information

In This Chapter

This chapter includes the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear™ product is not required. In the event of problems with your card, the following basic troubleshooting checklist may help identify the source of the problem. If the module still does not appear to be working properly after checking all possible causes, please contact your openGear™ products distributor, or the Technical Support department at the numbers listed under the "Contact Us" section at the end of this manual.

1. **Visual Review —** Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the module, the frame, and any associated peripheral equipment for signs of trouble.
2. **Power Check —** Check the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.
3. **Reseat the Card in the Frame** — Eject the card and reinsert it in the frame.
4. **Check Control Settings —** Refer to the Installation and Operation sections of the manual and verify all user-adjustable component settings.
5. **Input Signal Status —** Verify that source equipment is operating correctly and that a valid signal is being supplied.
6. **Output Signal Path —** Verify that destination equipment is operating correctly and receiving a valid signal.
7. **Module Exchange** — Exchanging a suspect module with a module that is known to be working correctly is an efficient method for localizing problems to individual modules.

Warranty and Repair Policy

The openGear™ card is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory.

In the event that your Cobalt Digital Inc. card proves to be defective in any way during this warranty period, Cobalt Digital Inc. reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this openGear™ card has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

In no event shall Cobalt Digital Inc. be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This openGear™ card Owner's Manual provides all pertinent information for the safe installation and operation of your Cobalt Digital Inc. Product. Cobalt Digital Inc. policy dictates that all repairs to the openGear™ card are to be conducted only by an authorized Cobalt Digital Inc. factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Cobalt Digital Inc. factory representative, will automatically void the warranty. Please contact Cobalt Digital Inc. Technical Support for more information.

In Case of Problems

Should any problem arise with your openGear™ card, please contact the Cobalt Digital Inc. Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your openGear™ card. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Cobalt Digital Inc. will be shipped collect.

The Cobalt Digital Inc. Technical Support Department will continue to provide advice on any product manufactured by Cobalt Digital Inc., beyond the warranty period without charge, for the life of the equipment.

Ordering Information

9033 and Related Products

Your **9033 HD/SD Analog to Digital Converter with Audio Embedding** is a part of the openGear™ family of products. Cobalt Digital offers a full line of openGear™ terminal equipment including distribution, conversion, monitoring, synchronizers, encoders, decoders, embedders, and de-embedders, as well as analog audio and video products.

Standard Equipment

- **9033** HD/SD Analog to Digital Converter with Audio Embedding
- **9033-OM** HD/SD Analog to Digital Converter with Audio Embedding Owner's Manual

Optional Equipment

- **9033-OM** HD/SD Analog to Digital Converter with Audio Embedding Owner's Manual (additional Owner's Manual)
- **8310-RM-10** openGear™ Rear Module compatible with 9033 (10 BNC connector)
- **8310-C** Digital Products Frame and Power Supply with Cooling Fans (2RU, holds 10 cards)
- **8310-C-BNC** Digital Products Frame and Power Supply with fixed 100-BNC Rear Module and Cooling Fans. (2RU, holds 10 cards)
- **MFC-8310-N** Network Controller Card (Additional)

Notes:

Contact Us

Contact Cobalt Digital Inc.

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